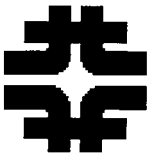

Fermilab

December 1, 2009

Hogan Nguyen
MS 310

Albert Stebbins
MS 209

Bruce Winstein
Univ. of Chicago

Dear Hogan, Albert, and Bruce,

Thank you for the proposal that Fermilab join the QUIET II Collaboration and participate in its Cosmic Microwave Background (CMB) B-mode polarization experiment, which we have designated P-998. I also thank you for your presentations at the recent Physics Advisory Committee (PAC) meeting, and the responses to the PAC's questions. In response to my charge, the PAC wrote the attached comments.

The PAC has endorsed the growing importance of CMB measurements to particle physics, and their alignment with the Fermilab mission. The Committee also noted the complementarity of the use of Monolithic Microwave Integrated Circuits to other methods being used in the field. The PASAG report was also very positive about QUIET II. Assuming that the NSF and DOE agree to fund the QUIET II proposals that they have received, we will work to find the support required for Fermilab to play the roles anticipated.

Good luck.

Sincerely,

Piermaria Oddone

Attachment

cc:
Y. Kim
S. Holmes
R. Kephart
G. Bock
J. Appel
R. Dixon
V. White
G. Apollinari
M. Lindgren
C. Hogan
D. Bauer
V. Shiltsev
L. Bauerdick
R. Van Kooten
M. Procario
J. Whitmore
D. Lissauer
D. Levy
F. Bernthal

Excerpt from Physics Advisory Committee Comments and Recommenations, November 2009

P-998 QUIET Phase II – The Search for B-Mode Polarization in the Cosmic Microwave Background Using Coherent HEMT Detectors (Nguyen)

Cosmic microwave background (CMB) measurements have been very important for astrophysics, cosmology, and particle physics. The scientific importance to particle physics continues to grow. The detection of the B modes imprinted in the cosmic microwave background polarization by gravitational waves could provide the most direct probe of the extremely high-energy physics of inflation, and is therefore well aligned with the particle astrophysics program of Fermilab. The ancillary CMB science is also important for particle physics. The detection at smaller angular scale of the B modes generated by gravitational lensing by the intervening mass distribution would probe the mass spectrum and constrain the sum of the masses of the neutrinos. This fits well scientifically with the astrophysics and neutrino programs at Fermilab. As with all CMB measurements, the experimental challenges are great.

QUIET II, a proposed CMB experiment located in Chile, approaches the observational challenges using a novel radiometer technology (Monolithic Microwave Integrated Circuits – MMICs) to make sensitive measurements of the CMB polarization over intermediate angular scales. This technology is complementary to bolometry, the method adopted by most of the field. QUIET II would have sufficient sensitivity at 90 GHz for a meaningful measurement, and has unique sensitivity at lower frequencies, providing an important handle on the foregrounds.

A $23M proposal is under review by NSF (Astronomy and Physics) and DOE for the experiment. A relatively small level of support (~$2M) for Fermilab participation has been proposed. There is strong scientific interest in the Laboratory, both by experimentalists and theorists.

The Fermilab participation in QUIET II was positively reviewed by PASAG. Fermilab participation in QUIET II strongly satisfied the prioritization criteria of PASAG, and was therefore recommended in all funding scenarios. The PAC concurs. Fermilab would have a large and visible impact, both with key technical expertise on large-scale detector integration and on data analysis and interpretation. The Committee was impressed by the Fermilab QUIET II team.

Pending a positive result of the NSF/DOE review of the project, the Committee strongly supports the involvement of the Laboratory in QUIET II.